

of regarding the scale as a carpel rather than with Celakovsky, as an outer integument.

The remaining four chapters of the book are a comparative summary of those preceding, with two devoted respectively to fossil gymnosperms and geographical distribution. The fossil forms are treated practically from the standpoint of Scott and there are new illustrations of *Cycadeoidea* from the preparations of Wieland, of Yale. One looks perhaps for a rather more thorough treatment of the intermediate group of Cycadofilices from which, according to the authors, the cycads are derived through the Bennettitales, while the Ginkgoales and Coniferales originate through the Cordaitales. This phylogeny looks to the Filicales as the ancestral group of the Gymnosperms because of the close similarity of the Cycads and Cycadofilices.

The book serves as a very convenient and up to date summary of the literature of the subject; a separate bibliography is given for the five more important chapters and a complete bibliography at the end of the book. The references from the text are made, however, by numbers corresponding to the chapter bibliography, which is not as convenient for the reader as footnotes; and the chronological arrangement of even the shorter bibliographies seems unnecessary. The half-tone illustrations are not always as satisfactory as the older line work especially for anatomical reproductions (see Fig. 47), or for such morphological details as the seedling leaf forms (Fig. 42), of which the arrangement as a whole is excellent. The book undoubtedly provides a useful and concise review of the present knowledge of Gymnosperms.—

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*Practical Text-Book of Plant Physiology.* By D. T. MACDOUGAL, Ph.D. Longmans, Green & Co., 1901.

In this text-book the author departs somewhat from the usual arrangement of the subject found in the majority of plant physiologies. In the opening chapter on the "Nature and Relations of an Organism" are found excellently clear and concise definitions of such phenomena as rigor, irritability, tonicity, etc., which must be of great service to the student in forming a definite conception of these underlying and often not properly understood principles of plant physiology. Following this chapter are several on the relation of plants to various external agents. In the

first of these, the "Relation of Plants to Mechanical Forces," is found a very full treatment of experiments which have to do with contact stimuli—more particularly by the curling of tendrils—on which the author himself has already done much work.

The third chapter, entitled "Influence of Chemicals upon Plants," treats of this subject in its broadest aspect, including a full list of experiments on the toxic action of various salts. The title of this section may possibly be open to criticism by some, owing to the somewhat limited field which the term "chemicals" covers, in its common, though perhaps not correct, usage.

In the relation of plants to the influence of water, gravity, temperature, electricity and light is found the subject of the next five chapters. In the consideration of the influence of light the author treats it from the interesting standpoint of light as a stimulating rather than as a retarding agent in the matter of phototropic effects.

Chapter nine deals with the "Composition of the Body," or, in other words, with the substances found in plants. Following this the "Exchanges and Movements of Fluids," including osmosis, the transpiration current, etc., are taken up, while "Nutritive Metabolism" is not introduced until the eleventh chapter.

In connection with this we find the subject of the next chapter is "Respiration, Fermentation, and Digestion." Under the last-named head fall the experiments with enzymes which are very complete and practical.

The phenomena of growth in itself, aside from the growth attending curvatures, is kept until almost the last, perhaps that they may be contrasted and compared with those of reproduction, which is very fittingly the final chapter of the book. An appendix of chemical and physical tables and a copious index is included.

Throughout the book we find a clear cut and concise style which to the student will prove a great boon. Particularly are the opening sections of each chapter to be mentioned; they serve to properly orient the reader on what is to follow. When the immense ground to be covered is considered, the very complete list of experiments can but prove satisfactory and almost always well chosen. Several new contrivances, among which is a precision auxanometer, will recommend themselves to the experimenter.

H. M. RICHARDS.